Marley CoolBoost® Fan and Pump Control Panel System

User Manual 09-1368

Marley

Introduction

NEMA 4X fiberglass outdoor enclosure with the following features:

- *Hinged and lockable outer door*
- *Swing-out dead front inner door*
- *Corrosion resistant enclosure*
- *Operators mounted on inner door*

Electrical Components

- *External disconnect handle with padlocking provisions to meet lockout, tag-out safety requirements*
- *Main circuit breaker with thermal and magnetic overload protection*
- *Solid-state temperature controller with two-line display showing set-point and coil fluid temperature*
- *RTD with dry well*
- *Fan and pump starter*
- *Pilot lights*
- *Status contacts*
- *Wiring diagram laminated and mounted on inside door*
- *Built to UL508 and CUL508 safety requirements*

Options:

- *Single Point Power Connection*
- *Integrated basin heater controls*
- *Integrated water level controls*
- *Integrated damper power circuit*
- *VFD feeder breaker if fan is controlled with remote VFD*
- *Factory installed and wired on selected products*

Introduction

These instructions are intended to assure that field connections are completed properly and the control system operates for the maximum time possible. Since product warranty may depend on your actions, please read these instructions thoroughly prior to operation.

If you have questions about the operation and/or maintenance of this control system and you do not find the answers in this manual, please contact your Marley sales representative.

⚠ Warning

Hazard of electrical shock or burn. Be sure to turn off power to the panel before servicing. If working on equipment out of site of panel disconnect, lockout using standard lockout procedure.

Safety First

The Marley® control system uses UL listed components installed in accordance with the National Electric Code. The location of the cooling product and field installation of the control system can affect the safety of those responsible for installing, operating or maintaining the tower and controls. However, since SPX Cooling Technologies does not control the fluid cooler location, or field installation, we cannot be responsible for addressing safety issues that are affected by these items.

⚠ Warning

The following safety issues should be addressed by those responsible for installation, maintenance or repair of the tower and controls:

- ***Access to and from the control panel (including the customer supplied main disconnect/branch circuit protection.)***
- ***Proper grounding of electrical control circuits.***
- ***Sizing and protection of branch circuits feeding the control panel.***
- ***Qualification of persons who will install, maintain and service the electrical equipment.***

These are only some of the safety issues that may arise in the design and installation process. SPX Cooling Technologies strongly recommends that you consult a safety engineer to be sure that all safety considerations have been addressed.

⚠ Warning

Other safety issues are addressed in literature supplied with your cooling product. You should closely review the literature prior to installing, maintaining or repairing your cooling product.

Installation

The control panel may be mounted indoors or outdoors. Inside the control panel are steel mounting feet which may be bolted into the enclosure mounting holes and extend beyond the outside dimensions of the enclosure.

Locate all incoming and outgoing terminations in the bottom of the enclosure to avoid water entering the control panel.

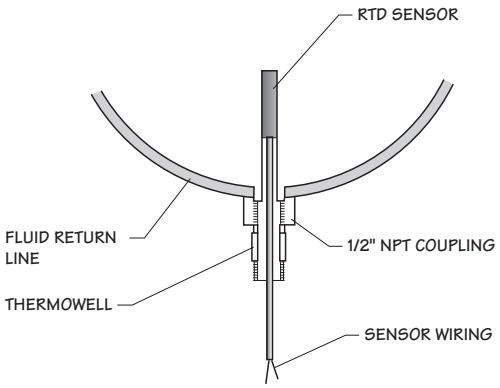
Install the Marley RTD in the discharge piping coming from the coil discharge.

Note

Do not install the RTD in the fluid cooler coil piping.

Locate the RTD close to the fluid cooler to avoid building in a delayed reaction time. The dry well is furnished with a ½" NPT stainless steel fitting. Insertion length is 2½" or less into the pipe depending on pipe fitting. Locate the dry well in the side or bottom of the pipe to assure the tip of the dry well is covered with fluid at all times.

Run control wiring from the RTD to terminal points located in the control panel. Belden # 8770 wire is recommended.



RTD

Temperature Controller–located in CoolBoost panel

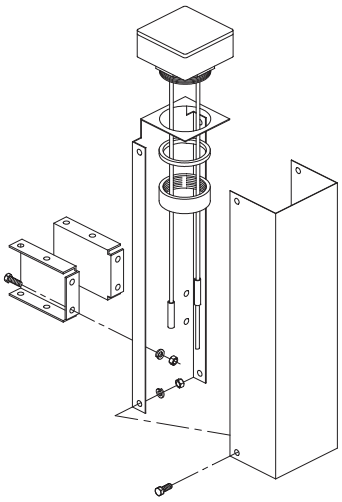
Belden #8770
3-wire plus Shield

Installation

Circulating Pump Circuits

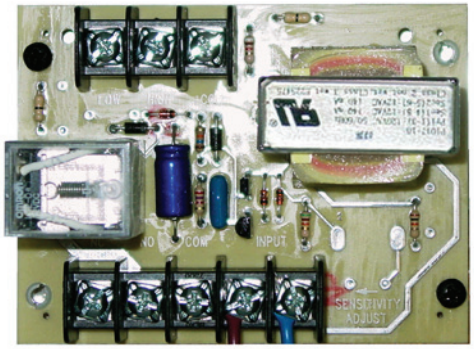
The circulating pump circuit utilizes two safety circuits to protect the pump, a low water shut off and freezing water shut off. These circuits are furnished as standard on every fluid cooler.

A dedicated stilling chamber with one reference probe and one level probe is furnished in the cold water basin serving as water level feedback for the low water safety circuit. An optional second stilling chamber may be furnished with additional level probes but services a different purpose such as water make up and alarm. Connect the two low water probes located in the basin stilling chamber to user terminal points in the CoolBoost control panel. Marley probes are furnished with 20'-0" leads which may be lengthened by splicing 18 gauge control wiring. Refer to the wiring diagram in the CoolBoost control panel for connection points.



Stilling Chamber

Water Level Probes



Water Level Card

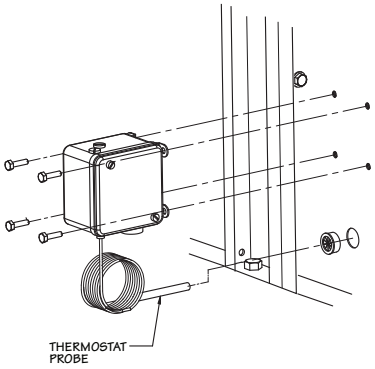
Installation

For the freeze safety circuit run two 18 gauge control wires from the thermostat located on the fluid cooler side casing to user terminal points in the CoolBoost control panel. The thermostat has two sets of terminal points. Use either the left or right two points oriented in a vertical column.

Note

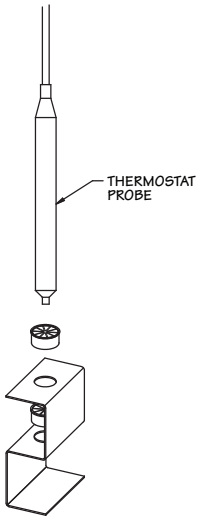
Adjust the temperature range so the red arrow on the left points to 35˚F as shown below.

The thermostat, provided with this system, requires adjustment. Remove the inner most brass fitting located on the thermostat enclosure to gain access to the adjusting screw. Adjust cut-out set point temperature to 45˚F. This automatically sets the cut-in point at 35˚F.

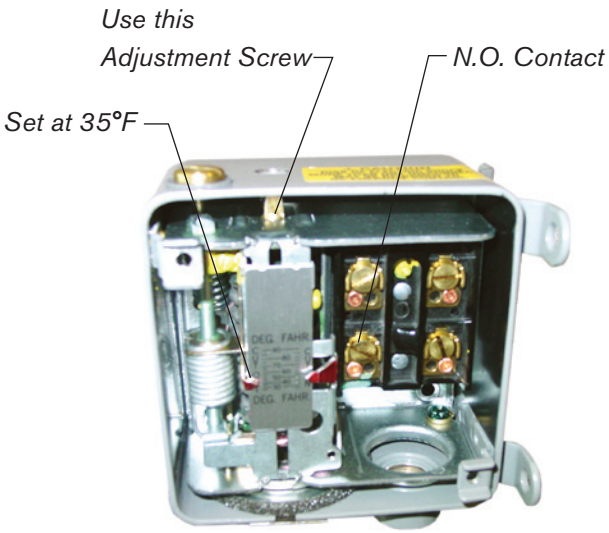


Thermostat Installed on Casing

Thermostat and Probe



Thermostat Probe Installation



Thermostat

Operation

Main circuit breaker: Operating handle for the main breaker is located behind the outer door which is pad-lockable for lock out/tag out.

Rotating the handle to the OFF position turns power off to the panel.

Rotating the handle to the ON position provides power to the control panel.

If servicing the panel hot (door open and main breaker in energized position) be sure to align the keyed slot on back of the operating handle with the key on the main breaker shaft before closing the door.

Power "ON" light: A pilot light indicates the main disconnect is on and the control panel is powered.

Fan circuit:

Full voltage across the line starter.

Bi-metal type motor overload protection.

H-O-A selector switch control.

Solid state PI type temperature controller.

Dual display on the Pi temperature controller shows process fluid (PV) and set point (SP) temperatures.

Set point temperature is adjustable from the controller's keypad by pressing the up and down arrows on the keypad.

RTD with dry well used to sense temperature for the temperature controller.

User terminal points for vibration switch shut down circuit.

Fan Operation: Program the temperature controller with the required set point value. 85°F is the factory default and may be field adjusted. On the Love Controls series 16B controller press UP or DOWN arrow button to adjust the set point temperature. The display will revert to the normal screen within 30 seconds.

HAND position - With the selector switch in HAND the fan motor will energize and will run at a constant full speed. The HAND position may be used to bump the motor to check fan rotation or manual motor operation.

OFF position – Fan motor will be de-energized

AUTO position – In AUTO position the temperature controller controls the ON and OFF cycling of the fan motor. The temperature controller compares the error difference between the discharge fluid measurement by the RTD and the set point value making the decision to turn the fan motor on or off.

Operation

Temperature Controller Information

Solid State Temperature Control for one and two speed control panels

Temperature Controller:	Love Control cat # 16B-33 controller
RTD:	Marley item # D37528 RTD 3 wire PT100

Love solid state temperature controller using an RTD to measure cold water discharge temperature providing ON-OFF starter control.

The Love 16B-33 temperature controller furnished in this control panel has been preprogrammed as follows.

Marley CoolBoost Programming Parameters:

Single speed motor programming:

Primary menu:

SV = 85Push (enter) for 3 sec.
CnPt = Pt (enter) push index
tPun = F (enter) push index
tP-h = 300 (enter) push index
tP-L = 0 (enter) push index
CtrL = onoF (enter) push index
S-HC = Cool (enter) push index
ALA1 = 6 (enter) push index
ALA2 = 7 (enter) push index
ALA3 = 11 (enter) push index
SALA = oFF (enter) push index
CosH = oFF
Ignore everything below CosH
Push (enter) twice
Cts = 5.0 (enter) push index
tPoF = 0.0 (enter) push index
Push (enter)
Push index

Operation

r-S = rUn (enter) push index
SP =0 (enter) push index
AL1H = 110 (enter) push index
AL2L = 43 (enter) push index
AL3H = 13 (enter) push index
AL3L = 8 (enter) push index
LoC = LoC2 Push (enter)

These settings yield the following operation:

Single speed motor programming:

Low speed ON at 90°F (Setpt 1 / Output A)
Low speed OFF at 85°F (Setpt 1 / Output A)
Alarm ON above 110°F and below 43(AL1)
Note: Out put #2 is programmed but not used for 1S1W motor.

Two speed motor programming:

Low speed ON at 90°F (Setpt 1 / Output A)
High speed ON at 99°F (Setpt 2 / Output B)
High speed OFF at 93°F (Setpt 2 / Output B)
Low speed OFF at 85°F (Setpt 1 / Output A)
Alarm ON above 110°F and below 43 (AL1)

Note

Setpoint 2 is a deviation of Setpoint 1, so the actual ON and OFF points will change when Setpoint 1 is changed.

Operation

Pump Operation

Standard operation of the pump is by manual control only, using a two-position selector switch located on the door. A removable “run enable” jumper is provided so customer may take control of cycling the pump. See the control panel wiring diagram.

⚠ Caution

Cycling the pump on and off for temperature control could cause scaling on the coils and is not recommended.

OFF-ON Selector Switch

- OFF position – pump motor is off.
- ON position – pump motor will run constantly unless a safety circuit is activated.

If the water temperature in the cold water basin drops to 35°F a N.O. contact from the remote thermostat will close and latch-in a relay, which in turn shuts off the circulating pump. This is a safety circuit to prevent pumping freezing water. To reset this circuit, press the reset button on the door. The circuit can be only reset once the cold water basin temperature rises above 45°F.

If the basin water drops to a dangerously low level, the water level card contact will close and also energize the latch-in relay shutting the circulating pump off. This is a safety circuit preventing the pump from running dry. To reset this circuit, press the reset button on the door. The circuit can only be reset if the water in the basin has risen to an acceptable operating level.

Options

Integrated Basin Heater Control Circuit

This circuit monitors the water temperature in the cold water basin via a probe type sensor mounted through the side wall of the cold water basin.

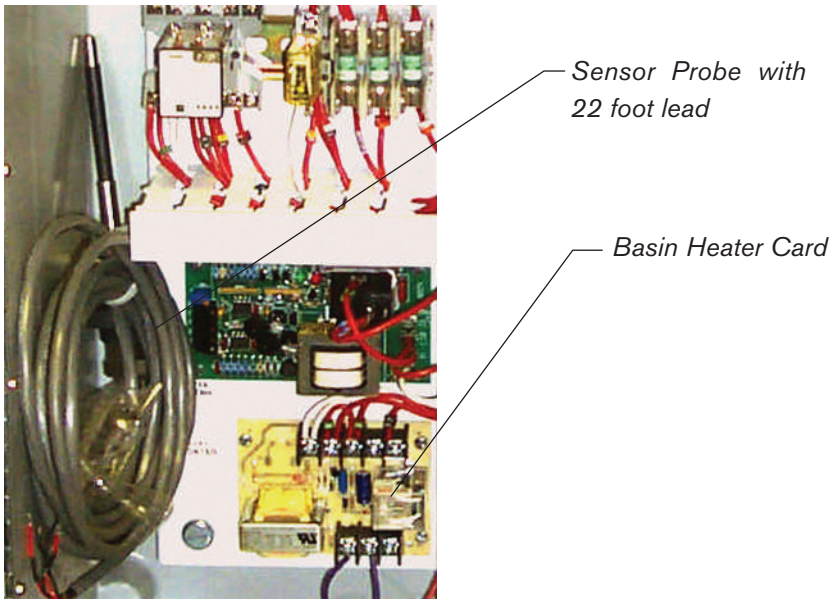
The temperature probe is furnished with 22 feet of lead length. Longer lead lengths up to 99 feet are available.

Note

Do not add wiring to the probe lead.

The solid state control card is located inside the CoolBoost control panel.

A power contactor inside the control panel is used to energize the heating element.



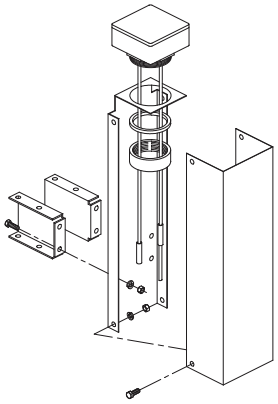
The temperature card and basin heater element maintains water temperature in the basin between 40° F and 45° F.

The temperature probe includes a low water cut off circuit. If the water level falls below the temperature probe the basin heater contactor will not energize.

Options

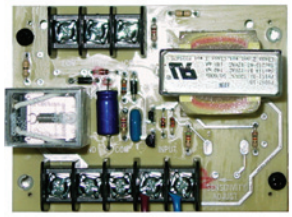
Solid State Water Level Control and Alarm Circuit

The number of probes depends on the number of optional circuits being furnished. Each water level event requires one card. The card includes an on-board relay with (1) form “C” dry contact. Contacts are wired to a user



Stilling Chamber

Water Level Probes



Water Level Card

terminal strip for connection to remote devices such as makeup solenoids and alarms.

Water make-up control – Form “C” 1- N.O. 1 – N.C. contact wired to 120 VAC fused circuit for customer use to power a remote solenoid.

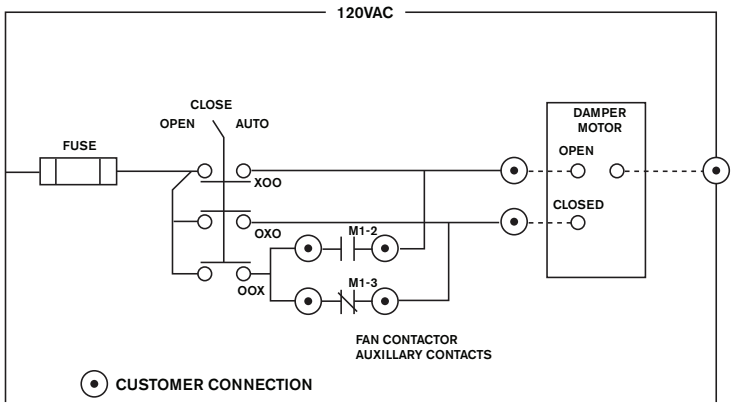
High water alarm - N.O. contact wired to user terminal block
Low water alarm - N.O. contact wired to user terminal block
High water cutoff – N.C. contact wired to user terminal block
Low water cutoff - N.C. contact wired to user terminal block

Pump Heat Trace

If circulation pump is has the heat trace option connect the heat trace tape back to the CoolBoost control panel.

Options

Damper "Local" Control Circuit



This circuit is furnished when a damper control option is ordered and the damper circuit is controlled from the CoolBoost panel in coordination with the fan starter.

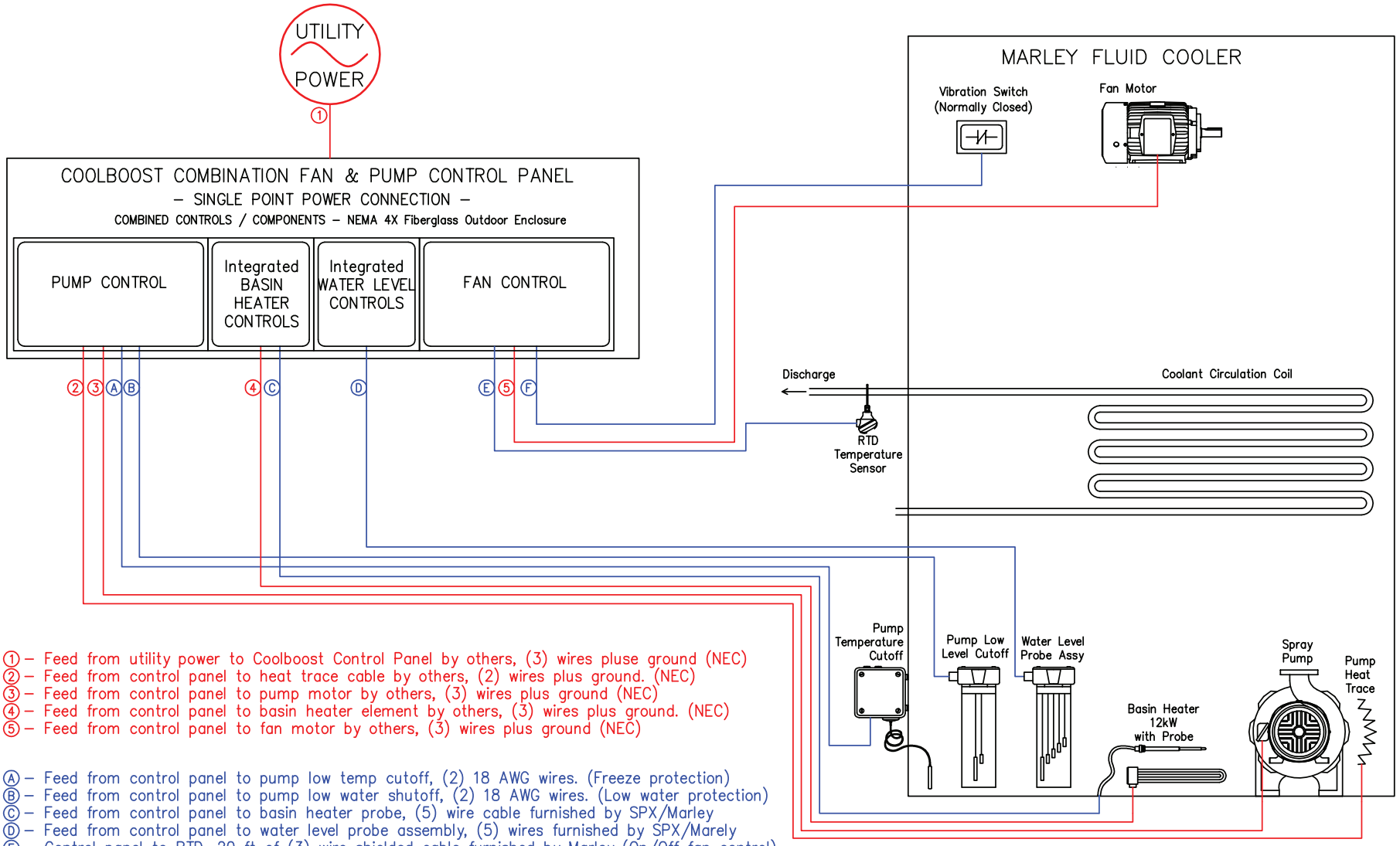
The panel is furnished with a 120 VAC circuit for powering the damper actuator motor.

Three wires and a ground are required between the control panel and the damper motor. 120 VAC power for the actuator motor on the damper is brought out to user terminal points inside the panel.

Operation: The damper will open when the fan motor is energized and will close when the fan motor is off.

H-O-A selector switch operation:

HAND position:	Damper opens
OFF position:	Damper closes
AUTOMATIC position:	Damper is closed when fan is off

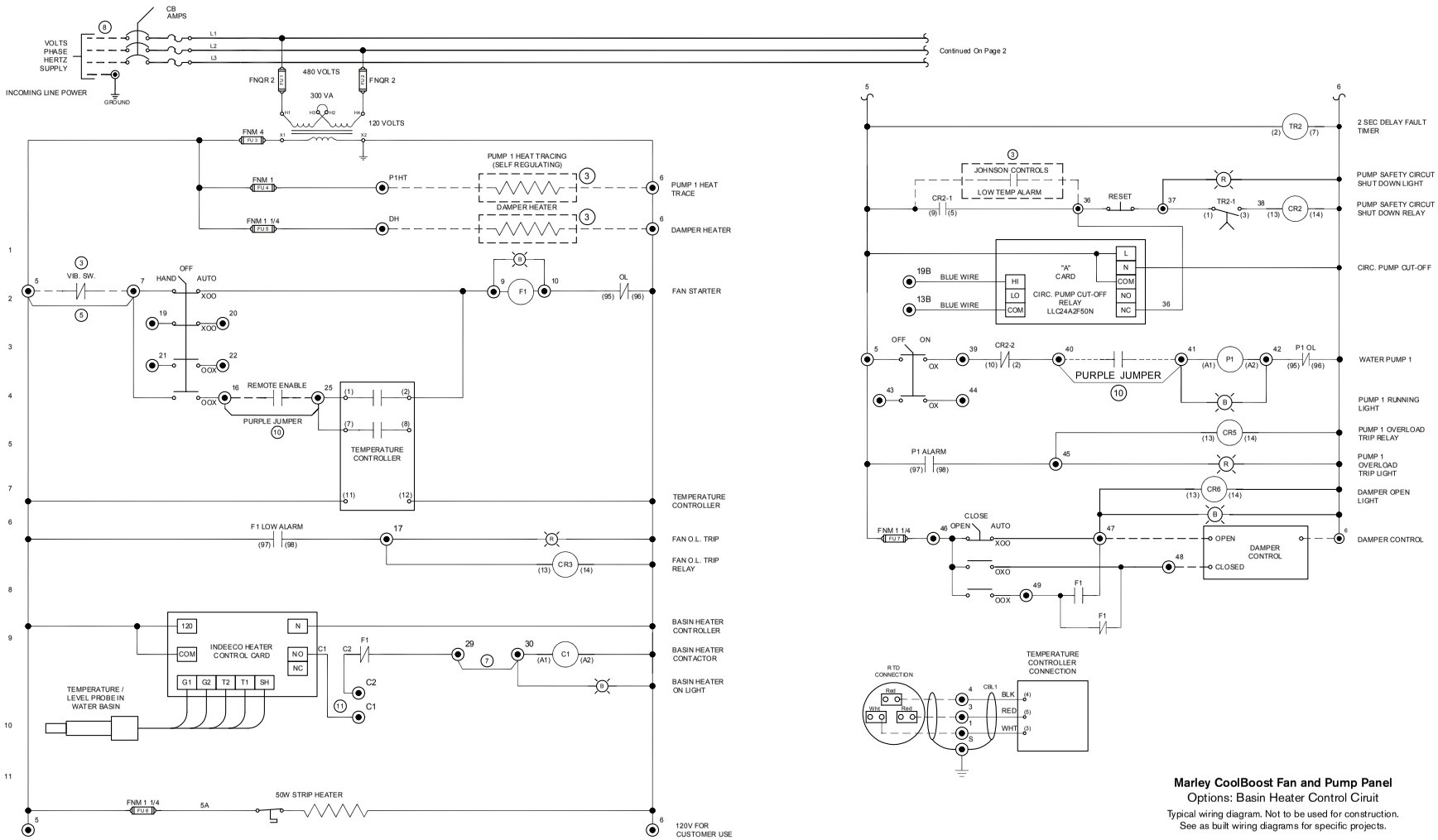


① – Feed from utility power to Coolboost Control Panel by others, (3) wires pluse ground (NEC)
② – Feed from control panel to heat trace cable by others, (2) wires plus ground. (NEC)
③ – Feed from control panel to pump motor by others, (3) wires plus ground (NEC)
④ – Feed from control panel to basin heater element by others, (3) wires plus ground. (NEC)
⑤ – Feed from control panel to fan motor by others, (3) wires plus ground (NEC)

Ⓐ – Feed from control panel to pump low temp cutoff, (2) 18 AWG wires. (Freeze protection)
Ⓑ – Feed from control panel to pump low water shutoff, (2) 18 AWG wires. (Low water protection)
Ⓒ – Feed from control panel to basin heater probe, (5) wire cable furnished by SPX/Marley
Ⓓ – Feed from control panel to water level probe assembly, (5) wires furnished by SPX/Marely
Ⓔ – Control panel to RTD, 20 ft of (3) wire shielded cable furnished by Marley (On/Off fan control).
Ⓕ – Fan shut–down circuit, between fan control and vibration switch N.C. connection by others.

——— = POWER WIRING
——— = CONTROL WIRING

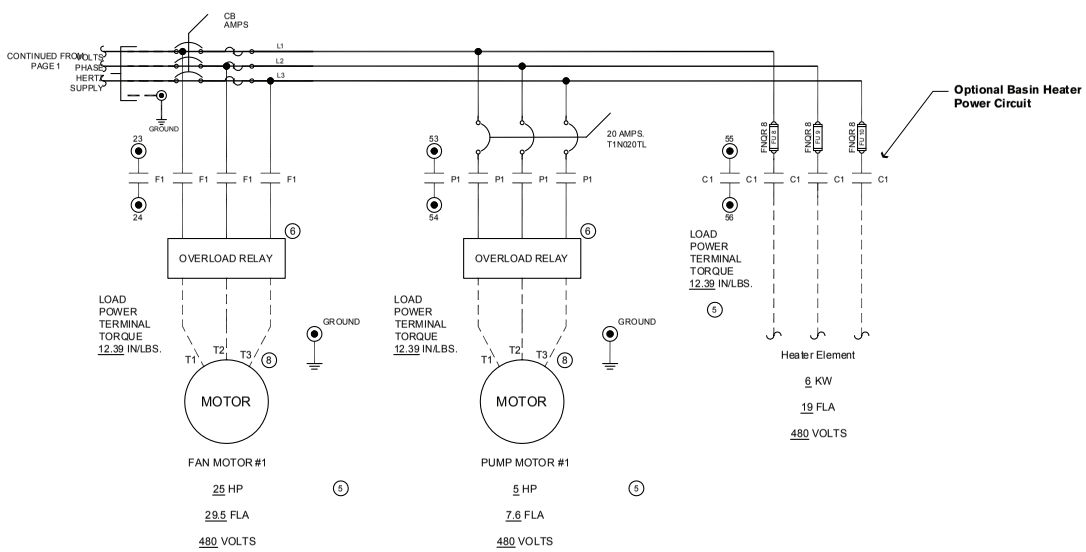
Typical Schematic Showing Options

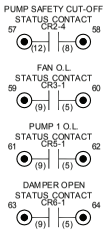


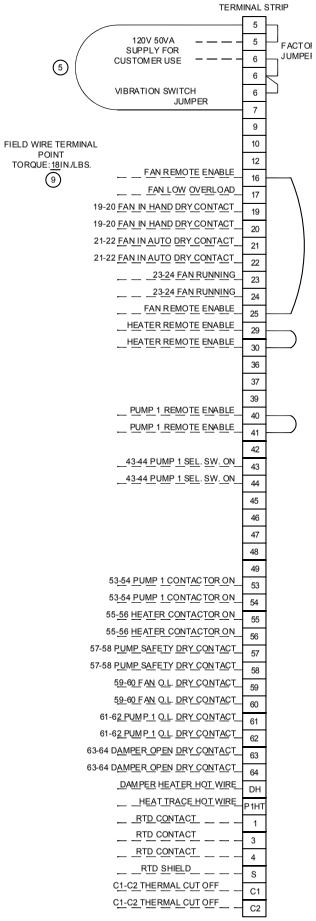
Marley CoolBoost Fan and Pump Panel

Options: Basin Heater Control Ciruit

Typical wiring diagram. Not to be used for construction.
See as built wiring diagrams for specific projects.






TERMINAL STRIP
120V 50VA
SUPPLY FOR
CUSTOMER USE
5
VIBRATION SWITCH
JUMPER
FACTOI
JUMPEI
FIELD WIRE TERMINAL
POINT
TORQUE: 18 IN./LBS.
9
FAN REMOTE ENABLE 16
FAN LOW OVERLOAD 17
19-20 FAN IN HAND DRY CONTACT 19
19-20 FAN IN HAND DRY CONTACT 20
21-22 FAN IN AUTO DRY CONTACT 21
21-22 FAN IN AUTO DRY CONTACT 22
23-24 FAN RUNNING 23
23-24 FAN RUNNING 24
FAN REMOTE ENABLE 25
HEATER REMOTE ENABLE 29
HEATER REMOTE ENABLE 30
PUMP 1 REMOTE ENABLE 40
PUMP 1 REMOTE ENABLE 41
43-44 PUMP 1 SEL. SW. ON 43
43-44 PUMP 1 SEL. SW. ON 44
53-54 PUMP 1 CONTACTOR ON 53
53-54 PUMP 1 CONTACTOR ON 54
55-56 HEATER CONTACTOR ON 55
55-56 HEATER CONTACTOR ON 56
57-58 PUMP SAFETY DRY CONTACT 57
57-58 PUMP SAFETY DRY CONTACT 58
59-60 FAN O.L. DRY CONTACT 59
59-60 FAN O.L. DRY CONTACT 60
61-62 PUMP 1 O.L. DRY CONTACT 61
61-62 PUMP 1 O.L. DRY CONTACT 62
63-64 DAMPER OPEN DRY CONTACT 63
63-64 DAMPER OPEN DRY CONTACT 64
DAMPER HEATER HOT WIRE DH
HEAT TRACE HOT WIRE P1HT
RTD CONTACT 1
RTD CONTACT 3
RTD CONTACT 4
RTD SHIELD S
C1-C2 THERMAL CUT OFF C1
C1-C2 THERMAL CUT OFF C2

CANDO Control Panel
Two Speed, One Winding, Three Phase

Note:

1. ◉ Terminal point number on terminal block
2. ( ) Indicates actual markings on device
3. Remote located equipment
4. – – – – Field wiring by others. USE COPPER WIRE ONLY.
5. Jumper must be removed when vibration switch is used.
6. Set high and low overload amperage to motor nameplate.
7. Remove purple jumper when adding heater cut off.
8. Incoming power wire rating: 60 degrees celcius.
9. Field wire: 16 AWG.
10. Remove purple jumper when remote enable is used.
11. C1 & C2 connects to thermal cut off basin heater element.

Marley CoolBoost Fan and Pump Panel
Optional Basin Heater Control Cirucit

Typical wiring diagram. Not to be used for construction.
See as built wiring diagrams for specific projects.

Troubleshooting

Trouble	Cause	Remedy
Control Power No power ON light	Main disconnect OFF	Make sure main disconnect switch is in the ON position
	Blown fuse(s)	Check primary and secondary fuses for the control supply voltage located on top of the control power transformer. Check incoming Line Voltage fuses. (replace fuses as necessary.)
Fan Motor Power Light is ON but the fan motor(s) will not operate in the HAND position.	Vibration switch, external safeties, or run permission contacts are inhibiting closure of the fan motor contactor (open circuit between terminals 5 and 7).	Reset vibration limit switch and/or verify customer start inhibit does not exist. (e.g. Building automation, Emergency Stop)
	Fan motor OL (Over-Load) tripped.	Verify the OLs sized correctly. (heater size or dial setting.) Reset motor OL. To reset OLs, sufficient time must elapse to cool the bi-metal OL heaters.*
Fan Motor Power Light is ON but the fan motor(s) will not operate in the AUTO position only.	Set point temperature programmed into the temperature controller is higher then the actual temperature of the fluid in the coil therefore there is no call for cooling.	Lower the set point value in the controller
	Temperature controller indicates an alarm. (Amber AL)**	Program controller to an appropriate alarm setting.** Then, press reset button located on the front door of the control panel.
	Temperature controller is not functioning properly.	First, verify the controller is not in a fault condition, that the setpoint of the controller is accurately programmed, and the fluid being cooled has reached the temperature required to run the fan motors. Then using a voltage meter, check for 120VAC being present between terminals 16 and 6. Then check for 120VAC between terminals 9 and 6. If voltage exists between 16 and 6 and not between 9 and 6 call for assistance to replace the PI controller.
Pump Motor When the pump switch is turned to the ON position, the circulating pump motor will not run.	Pump motor OL. (Over-Load) tripped.	Verify the OLs sized correctly. (dial setting) Reset motor OL. To reset OLs, sufficient time must elapse to cool the bi-metal OL heaters.**
	Tripped circuit breaker for pump motor supply voltage.	Reset the circuit breaker
	The pump alarm light has energized.	Make appropriate adjustments to insure basin water level meets requirements. Once basin water has reached its required level press the alarm reset located on the front of the control panel.
	The pump alarm light has energized.	Make appropriate adjustments to insure basin water temperature meets requirements. Once basin water has reached its required temperature press the alarm reset located on the front of the control panel.
Integrated Basin Heater Control Option Basin heater control is not turning on. Heater element(s) in the cold water basin are not heating the water.	Water temperature is above 45°F.	The water temperature must drop to 45°F before the basin heater circuit will energize the heater contactor. Once the contactor is energized, the heater(s) will remain on until the temperature is above 50°F.
	The fan motor is running.	The heater contactor circuit is designed not to energize the heater elements while the fan motor is running.
	Blown fuse(s).	If the fan motor is running and the basin cold water temperature is below 45°F. Check the voltage supply fuses to the heating elements. (replace fuses as necessary.)
	Heater Control circuit card or heater elements not functioning correctly.	If the fan motor is running and the basin cold water temperature is below 45°F. Call for troubleshooting assistance in determining if replacement of heater control card or heater element is necessary.
Integrated Damper Control Option Damper switch will not manually open or close the damper.	Blown fuse.	If by switching the OPEN, OFF, AUTO selector between OPEN and OFF does not change the position of the damper. Check FU3 fuse which supplies the damper control circuit. (replace blown fuse.)
Integrated Damper Control Option Damper will open and close manually but will not open in AUTO.	Fan motor is not running.	To check AUTO operation of the damper control, the fan motor must be running. When fan is running, dampers should open. When fan is off, dampers should close. Check for correct wiring at the damper logic contacts.
Fan motor ALARM LIGHTS	Fan motor OL (Over-Load) tripped.	Verify the OLs sized correctly. (dial setting.) Reset motor OL. To reset OLs, sufficient time must elapse to cool the bi-metal OL heaters.*
Pump motor ALARM LIGHTS	Pump motor OL (Over-Load) tripped.	Verify the OLs sized correctly. (dial setting.) Reset motor OL. To reset OLs, sufficient time must elapse to cool the bi-metal OL heaters.*

* Over Load tripping is caused by excessive motor current. Frequent and continued tripping indicates possible motor and or mechanical operation problems. Troubleshooting procedures must be performed on these associated components to determine the cause of the over current condition.

** The alarm setting on the temperature controller has been factory preset at 40°F. A 5° differential exists between the when alarm is activated and when a reset is accepted. For example if the programmed alarm temperature is reached, the fluid temperature would need to rise an additional 5° in order to reset the controller (if set at 40°, it must rise above 45°).

SPX COOLING TECHNOLOGIES, INC.
7401 WEST 129 STREET | OVERLAND PARK, KANSAS 66213 UNITED STATES | 913 664 7400 | spxcooling@spx.com | **spxcooling.com**

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